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The role of personality in the selection of a major: With and without vocational self-efficacy and interests

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Abstract

The purpose of this study is to examine the role of personality traits measured by the Multidimensional Personality Questionnaire (MPQ; Tellegen, 2000; Tellegen & Waller, 2008) in selecting educational majors. Personality traits were examined alone, and with the combination of Holland's hexagonal confidence domains, as measured by the general confidence themes (GCT) of the Skills Confidence Inventory (SCI; Betz, Borgen,, & Harmon, 2005), and Holland's interest domains, as measured by the general occupational themes (GOTs) of the 2005 Strong Interest Inventory (SII; Donnay, Morris, Schaubhut, & Thompson, 2005). Personality traits significantly contributed to the discrimination of nine educational major families in a sample of 368 undergraduate decided students. When the set of confidence and interest scales was added to the personality traits, the conservative jack knife hit rate was almost doubled.

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The Role of Personality in the Selection of a Major: With and Without Vocational Self-efficacy and Interests

In vocational counseling, counselors sometimes assume that certain personality traits in a client may make her/him more or less likely to pursue a particular major. For example, extraverted clients may be seen as more likely to pursue business careers; neurotic clients may be viewed as more likely to be interested in artistic pursuits. Likewise, John Holland in his writings noted that choice of occupation and by extension, choice of educational major, is an expression of personality (Holland, 1997). Also, the role of personality traits in vocational choice actions (e.g., selection of a major) is explained in social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994) and forms the conceptual foundation of the study. That is, personality is a precursor to vocational choice actions and influences choice actions through domain-specific self-efficacy and interests.

The intent of this article is to examine how personality traits can help differentiate one's choice of college major. In order to accomplish this goal, it was necessary to choose a personality model that was comprehensive and yet parsimonious, in which personality traits already were shown to relate to interests closely corresponding to college majors. Including personality traits closely related to interest would be helpful for counselors to assist vocational clients in choosing majors that are consistent with their interests and personality traits. For example, an extraverted client who is socially persuasive would be well suited to choose a marketing college major. Some work relating personality and college major has come from an examination of the personal style scales of the 1994 Strong Interest Inventory (Harmon, Hansen, Borgen, & Hammer, 1994) which are global measures of preferences in living (e.g., learning environment) and working (e.g., work style) derived from interest items. The personal style scales have been shown to differentiate among college majors (Donnay, Morris, Schaubhut, & Thompson, 2005; Gasser, Larson, & Borgen, 2007; Rottinghaus, Gaffey, Borgen, & Ralston, 2006). Although information linking the personal style scales with choice of major is informative, it is limited due to the personal style scales being mostly related to extraversion and openness (Lindley & Borgen, 2000) and the personal style scales being related to but distinct from personality traits (see Harmon et al., 1994; Donnay et al., 2005).

Personality Alone

In this study, we chose a well known personality model developed by Auke Tellegen and colleagues consisting of 11 comprehensive, nonoverlapping personality traits, which were operationalized in the Multidimensional Personality Questionnaire (MPQ, Tellegen, 2000; Tellegen and Waller, 2000; 2008). The 11 MPQ primary scales have several strengths in investigating the association between personality and selection of college majors. First, the 11 MPQ primary scales capture distinct personality dimensions. For example, Tellegen and colleagues differentiated extraversion into three components: (a) love/affiliation labeled the social closeness primary scale, (b) social dominance or power labeled the social potency primary scale, and (c) control versus impulsivity labeled the control primary scale (Tellegen & Waller, 2008). This distinction of extraversion into more precise nonoverlapping traits is necessary in order to differentiate college majors that are enterprising in nature and more socially dominant (e.g., marketing) from those college majors that are social in nature and more affiliative in nature (e.g., elementary education). The capacity of the MPQ's social potency and social closeness scales to differentiate between enterprising and social interests has been demonstrated in the literature (Staggs et al., 2003; 2007). Second, the MPQ's 11 personality traits have already been shown to predict specific interests that may map onto college major. For example, harmavoidance has been shown to be negatively related to realistic interests and specifically interests in mechanical activities (Staggs et al., 2003; 2007). Third, the MPQ is comprehensive and includes the Big Five as well as additional traits beyond the Big Five. Six of the 11 MPQ primary scales have been used as markers of the Big Five: namely stress reaction (neuroticism), social closeness and social potency (extraversion), absorption (openness), aggression (inverse of agreeableness), and control (conscientiousness; Blake & Sackett, 1999; Church, 1994; Tellegen & Waller, 2008). Traits not used as markers of the Big Five include wellbeing, achievement, alienation, traditionalism, and harmavoidance.

The MPQ is organized into three higher order factors, namely positive emotionality (PEM), negative emotionality (NEM), constraint, and one distinct primary scale labeled absorption. The first higher order factor, PEM, comprises an agentic and communal component (Church, 1994; Tellegen & Waller, 2008). Agentic PEM includes three primary scales and captures positive emotions (wellbeing) and interpersonal effectiveness (social potency) and noninterpersonal effectiveness (achievement). Communal

PEM includes two primary scales (social potency and social closeness) and captures interpersonal connectedness (Tellegen & Waller, 2008). Three primary scales are included in NEM and encompasses negative emotions (stress reaction) and the tendency to be involved in antagonistic interpersonal transactions (aggression and alienation) (Tellegen & Waller, 2008). The constraint factor measures behavioral inhibition and includes three primary scales capturing cautiousness (control), tendency to avoid fear (harm avoidance), and conventionality (traditionalism). Finally, the primary scale, absorption, captures susceptibility to external stimuli. Although it includes both PEM and NEM, it is considered distinct (Tellegen & Waller, 2008).

No article was located related to personality traits embedded in the MPQ and the selection of college major with one exception (Ackerman and Beier, 2003). They used only three MPQ primary scales and used college majors retrospectively. They applied Ackerman and Heggestad's (1997) model to differentiate four major families. They created a trait complex *z* score for each trait complex by combining measures of specific personality traits, interests, and abilities that conceptually fit the model and that empirically loaded on the same factor. Of the three complexes, only the intellectual/cultural trait complex and the social trait complex included personality traits—absorption, social closeness, and social potency—measured by the MPQ. Their visual display showed that the trait complex *z* scores varied across the four academic major families (science/math, arts/humanities, social science, and business). One disadvantage of this study was that the authors were unable to determine the unique contribution of the specific personality traits in the separation of the four educational major families. Also, there were no majors included that would have fit within the clerical/conventional trait complex.

Although no other studies looking at college major using the MPQ were located, we identified only two additional studies that used the Big Five measured by some version of the NEO-PI-R (Costa & McCrae, 1992). De Fruyt and Mervielde (1996) sampled university students in Belgium and showed that the Big Five using a Dutch version of the NEO-PI-R differentiated 21 majors. They did not provide mean differences or any details about the significant functions in the discriminant analysis. Larson and colleagues (2007) provided evidence that, in a Taiwanese undergraduate sample, the Big Five personality traits contributed to distinguishing among four educational majors. Significant mean differences across majors

were seen on agreeableness (inverse of MPQ aggression).

Personality with Self-Efficacy and Interests

An additional purpose of the present study was to determine if self-efficacy and interests would remain potent predictors of vocational choice after personality traits have been considered. According to SCCT, personality is a distal determinant of choice actions while vocational self-efficacy and vocational interests are more proximal determinants. The influence of vocational self-efficacy as measured by the SCI (e.g., Betz & Rottinghaus, 2006; Larson et al., 2007; Rottinghaus, Betz, & Borgen, 2003) and interests as measured by the SII (e.g., Betz & Rottinghaus, 2006; Donnay, Morris, Schaubhut, & Thompson, 2005; Gasser et al., 2007; Harmon et al., 1994; Rottinghaus et al., 2003) in the choice of educational major has been well established in the literature and is not the focus of this study. Rather, we wanted to determine if self-efficacy and interest add incremental variance to choice actions after personality traits have been included. Prior studies have not explored this avenue. Other models besides SCCT support the assertion that personality will not be as salient as interests in the selection of an educational major. For example, Ackerman and Heggestad (1997) proposed a model whereby interests provide the motivation for the selection of activities, while personality and ability determine the success of those actions. From their perspective, interests should be more salient in choice of major while personality should be more salient in such things as satisfaction with the major. This assertion is consistent with the findings of Logue, Lounsbury, Gupta, and Leong (2007) who showed that business majors' satisfaction with their major was positively related to emotional stability, extraversion, and conscientiousness and minimally related to enterprising interests.

Besides studies using the personal style scales of the SII, no authors have examined how these three sets (personality, self-efficacy, and interests) uniquely and collectively contribute to college major. Ackerman and Beier (2003) provided evidence that personality, ability, and interests were part of a constellation of measures that visually separated major families on a graph. But they included only three personality traits and did not investigate the unique contribution of personality. De Fruyt and Mervielde (1996) showed that the Big Five and Holland's interests were predictive of students' fields of study in Belgium. They did not measure self-efficacy. Larson and colleagues (2007) provided evidence that, for

Taiwanese college students, vocational self-efficacy contributed significantly above and beyond the Big Five to the discrimination of educational majors. However, they did not measure interests and they did not measure personality traits beyond the Big Five. According to SCCT and the results of De Fruyt and Mervielde and Larson and colleagues, we anticipated that self-efficacy and interests would contribute significantly above and beyond personality to the discrimination of college majors.

In our study, students were screened, over the course of five semesters, so that only students who stated on a three-point scale (undecided, somewhat decided, decided) that they were decided about their majors were selected. Prior studies relied on the year in school as a proxy for decidedness (e.g., sophomores should be more decided than 1st year students) despite evidence from vocational counselors that students vary as to when they decide on a major. The resulting sample used in this study included nine educational major families; namely engineering, sport and exercise physiology, physical and biological sciences, architecture/design, humanities majors (e.g., journalism, languages, history, English, philosophy), social science majors (e.g., psychology, sociology), elementary education, business excluding accounting (e.g., management, marketing), and computer science/accounting majors. Accounting was placed with computer science because of its focus on data management and very little emphasis on people skills in contrast to other business majors like management or marketing/advertising.

Overview

The first objective of this study was to determine if personality relates to the selection of a major. We expected that the 11 personality traits measured by MPQ would significantly discriminate across the nine educational major families.

Positive emotionality. We anticipated that the PEM communal factors, namely social potency and social closeness would differentiate more people-oriented majors (e.g., business, elementary education) from majors that were less people oriented, such as engineering (Ackerman & Beier, 2003). More precisely, we expected that social closeness (affiliation component of extraversion) would be useful in separating elementary majors from engineering majors and that social potency (social dominance component of extraversion) would help separate business majors from other majors. Social closeness has been shown to be related to teaching interests (Staggs et al., 2007) and the inverse of social closeness was significantly

predictive of mechanical interests (Larson & Borgen, 2002; Staggs, Larson, & Borgen, 2003). Social potency was shown to be a significant predictor of sales interests (Larson & Borgen, 2002; Staggs et al., 2003).

Wellbeing may be useful in the separation of majors thought to have more social interests (e.g., elementary education) from other majors (Staggs et al., 2007). Achievement was anticipated to potentially be useful in the separation of science majors from other majors, because achievement has been shown to be related to science interests (Larson & Borgen, 2002; Staggs et al., 2007).

Negative emotionality. We anticipated that aggression (inverse of agreeableness) would be useful in differentiating majors that were thought to have more social interests (e.g., elementary education) from those that have less social interests (e.g., engineering) because aggression has been shown to negatively related to social interests and teaching interests (Staggs et al., 2007) and agreeableness (inverse of aggression) has been shown to be positively related to social interests (Larson et al., 2007; Larson, Rottinghaus & Borgen, 2002).

No hypotheses were made concerning stress reaction due to mixed findings. Staggs and colleagues (2003) showed that the inverse of stress reaction was significantly predictive of athletic interests, but other studies found no linkages of stress reaction or neuroticism to interests (Barrick, Mount, & Gupta, 2003; Larson et al., 2002; Staggs et al., 2007) or self-efficacy (Larson & Borgen, 2006). Alienation was not anticipated to vary across major based on prior studies (Larson & Borgen, 2006; Larson et al., 2002; Staggs et al., 2003).

Constraint. Harmavoidance (tendency to prefer fear over boredom) may have an influential role in differentiating among educational majors. Although no study has investigated directly the role of harmavoidance in the selection of college majors, indirect evidence suggests that harmavoidance may differentiate engineering from other major families. Studies have shown that harmavoidance provided considerable unique variance to the prediction of realistic and mechanical interests (Larson & Borgen, 2002; Staggs et al., 2003; 2007) as well as realistic confidence (Larson & Borgen, 2006) No hypotheses were made concerning control (conscientiousness) based on most evidence showing little to no linkages of control to conventional interests (e.g., Larson et al., 2002; Staggs et al., 2007) or confidence (e.g., Larson &

Borgen, 2006). No hypotheses concerning traditionalism was generated based on inconsistencies in the literature (Ackerman & Heggestad, 1997; Staggs et al., 2007).

Absorption. We hypothesized that absorption would be helpful in separating majors in the arts and humanities from majors that were less literary or artistic (e.g., computer science). This hypothesis was based on Ackerman and Beier's (2003) work and indirect evidence that absorption contributed substantially to the prediction of interests in the arts/music/dramatics (Larson & Borgen, 2002; Staggs et al., 2003).

Self-efficacy and interests. As to the second objective of this study, we expected that the combination of personality, self-efficacy, and interests would significantly discriminate educational majors and that self-efficacy and interests would significantly discriminate across educational majors above and beyond the contribution of personality.

Method

Participants

The sample included 368 undergraduate students from a large Midwest university (171 male, and 197 female) who participated in the study for experimental credit. Data collection occurred over the course of five semesters. The sample included 88.9% Caucasian Americans, 2.7% Hispanic Americans, 2.7% Asian Americans, 1.9% African Americans, and 3% international students. Participants' mean age was 19.3 (*SD* = 1.2). The criterion for inclusion in the study was decidedness on an educational major. We intentionally selected only students who were decided about their major based on their response to a three-point item (undecided, somewhat decided, and decided). Many participants (42%) were in their sophomore year in college, 31% were first-year students, 17% were juniors, and 10% were seniors at the time of participation.

Measures

Demographic variables. Several demographic variables of interest were measured. Specifically, students completed information about their age, college, educational major, and how decided they were about their current majors on a three-point scale (decided, tentatively decided, undecided).

Multidimensional Personality Questionnaire (MPQ). The Multidimensional Personality Questionnaire (MPQ; Tellegen, 2000) measures 11 primary personality traits labeled as the following

primary scales: wellbeing, achievement, social potency, social closeness, stress reaction, alienation, aggression, control, harmavoidance, traditionalism, and absorption. The MPQ has been shown to have excellent psychometric properties (see Tellegen, 2000; Tellegen & Waller, 2008). Based on a sample of 500 female and 300 male college students (Tellegen, 2000), internal consistency coefficients for the 11 primary scales range from $\alpha = .76$ (aggression) to $\alpha = .89$ (wellbeing, stress reaction). Test-retest reliability estimates range from .82 to .92 (Tellegen & Waller, 2008). There is an extensive body of literature providing evidence for the validity of the MPQ. Criterion-related validity has been established by predicting various behavioral criteria (e.g., McGue, Slutske, & Iacono, 1999) as well as physiological measures of emotion (e.g., White & Depue, 1999) from the MPQ primary scales. Convergent construct validity has been established by demonstrating that the MPQ scales correlate significantly and in a meaningful way with other prominent measures of personality such as the Big Five (e.g., Church, 1994). Further, the MPQ primary scales have shown to relate to other variables such as vocational outcomes (e.g., Larson & Borgen, 2002; Staggs et al., 2003) and relationship indices (Robins, Caspi, & Moffitt, 2000) as predicted by theory. Further evidence for construct validity of the MPQ comes from studies showing a good overlap between self and other ratings of the 11 primary scales (e.g., Harkness, Tellegen, & Waller, 1995). The MPQ is one of the most researched personality measures; a recent psych lit search by the first author yielded 1018 hits.

Strong Interest Inventory (SII). The Strong Interest Inventory (SII; Donnay et al., 2005) is a 291-item self-report inventory of occupational interests. The SII is comprised of three sets of scales; only the general occupational themes (GOTs) are used in this study. The GOTs, based on Holland's (1997) career framework, represent six broad areas of occupational interests known as the RIASEC domains; these are realistic interests (R), investigative interests (I), artistic interests (A), social interests (S), enterprising interests (E), and conventional interests (C). Individuals rate each item on a five-point Likert scale and higher scores denote higher interest. The 2005 SII has been normed on a nationally representative sample, which includes 30% of ethnic minority individuals, and represents 373 different occupations (Donnay et al., 2005).The six GOTs have high internal consistency with coefficient alpha exceeding .90 for each theme and 3 to 6 month test-retest reliability coefficients exceeding .80 (Donnay et al., 2005). The 2005 GOTs

have shown predictive utility in predicting college major (Gasser et al., 2007), and have been shown to be equivalent to the 1994 GOTs (Bailey, Larson, Borgen, & Gasser, 2008).

Skills Confidence Inventory (SCI). The Skills Confidence Inventory (SCI; Betz, Harmon, & Borgen, 1996; Betz et al., 2005) measures an individual's self-efficacy or confidence in being successful at various occupational activities and their corresponding academic course subjects. The SCI measures confidence with regard to the six RIASEC dimensions, which have been named as the general confidence themes (GCTs). The inventory is comprised of 60 items, with an equal numbers of items related to each GCT. Individuals rate their confidence on a five-point Likert scale which higher numbers reflecting more confidence. The GCTs have high internal consistency estimates ranging from .84 to .88 (Betz et al., 1996; 2005). Test-retest reliability estimates over a three-week period ranged from .83 to .87 (Parsons & Betz, 1998). There is strong evidence to support the validity of the SCI; it has been shown to discriminate educational majors (e.g., Betz et al., 1996; 2005) and occupational membership (e.g., Betz, Borgen, & & Harmon, 2006; Donnay & Borgen, 1999).

Procedure

Participants who had volunteered during mass testing sessions to participate in future research studies were recruited by email. Upon arrival at the laboratory, each participant was given a packet containing an informed consent form, a demographic questionnaire, the 2005 SII, the SCI as part of the Expanded Skills Confidence Inventory (Betz et al., 2003), and the MPQ; the three inventories were administered in random order to each participant to control for order effects. A one-way (order) Analysis of Variance (ANOVA) revealed no significant order effects. The packet of questionnaires took approximately three hours to complete. After completion of the questionnaires, participants were debriefed and received experimental course credit. Only students who were decided on their major were included in this sample. The data was collected across five semesters.

Results

Preliminary Analyses

Although we were not interested in sex differences in the MPQ, we did examine if there were any sex by major interactions. A Multivariate Analysis of Variance (MANOVA) revealed a significant main

effect of major (multivariate Wilks' Lambda $F[88, 2245.55] = 1.37$, $p = .01$, $\eta^2 = .04$) and sex (multivariate Wilks' Lambda $F[11, 341] = 8.32$, $p = .001$, $\eta^2 = .21$) but no significant sex by major interaction (multivariate Wilks' Lamda $F[77, 2050.86] = 1.05$, $p = .37$). Univariate ANOVAs were conducted for major on the 11 MPQ primary scales using a Bonferroni adjustment ($p = .05 / 11 = .005$). The means of social closeness, aggression, and harmavoidance were significantly different across the nine majors ($p < .005$; Table 1). To determine which of the nine majors were different from one another, we used a Tukey follow up comparison of $p < .05$. For social closeness, elementary education majors had a significantly higher level of social closeness than five major families (engineering, physical and biological science, architecture/design, social science, computer science/accounting majors). For aggression, the elementary education major family had a significantly lower score of aggression than four major families (sport and exercise physiology, social sciences, business, and computer science/accounting majors). Regarding harmavoidance, elementary education majors were more harmavoidant (i.e., choose boredom over fear) than all major families except two majors (business and computer science/accounting majors). Regarding the main effect for sex, the univariate ANOVAs using a Bonferroni adjustment of $p < .005$ showed that men reported significantly more alienation and aggression than their female counterparts; women reported significantly more social closeness and harmavoidance than men.

Personality Alone

Our first research hypothesis was that personality alone would significantly differentiate college major families. To test this hypothesis, a discriminant analysis was conducted controlling for sex; the predictors were sex and 11 MPQ primary scales and the dependent variables were nine majors. Results indicated that sex and the 11 MPQ primary scales, as a set, significantly differentiated nine college majors with a hit rate of 28% and a jack knife hit rate of 18.5% (Table 2). The hit rate indicates the accurate percentage in classifying the group memberships in the nine major families by using current predictors. The jack knife hit rate provides a cross-validation of the original hit rate through rerunning the analyses multiple times in which each analysis randomly removes one participant that is reentered in the next analysis (Betz, 1987). Because the chance hit rate of 1/9 = 11.1%, the jack knife hit rate of the set of personality traits and sex was over one and one half times greater than chance.

In addition, we tested the significant improvement of the hit rate after adding the 11 MPQ primary scales to sex as predictors. We followed the calculation procedure reported in Tabachnick and Fidell (2001) and examined the differences of two values of Wilks's lambda. The results indicated that the 11 MPQ primary scales contributed to additional variances beyond sex in discriminating nine college majors (F [96, 2354.38] = 1.38, $p < .05$). The squared canonical correlation, another commonly used effect size for discriminant analyses, was .164 in this study. This means that 16.4% of the variance of the unstandardized first discriminant function scores is explained by the 11 MPQ primary scales and sex.

For each significant discriminant function, group centroids and structure matrices provide useful information to help readers understand how specific predictors differentiate between groups (Betz, 1987). Group centroids indicate which group separates and differs from other groups the most. In each discriminant function, the group with the highest group centroid value is separated and different the most from the group with the lowest group centroid value. The structure matrix provides correlation coefficients between each predictor and each discriminant function. . As a result, readers can identify which predictor is highly correlated with the specific discriminant function.

Two significant discriminant functions emerged in classifying the nine majors. According to Table 3, the first significant function separated the elementary education major family from the engineering major family. Sex, social closeness, harmavoidance, and aggression (negative loading) had the highest correlations with this function. As can be seen in Table 1, the elementary education major family had the highest social closeness and harmavoidance mean scores and the lowest aggression mean score while the engineering major family had the lowest social closeness and harmavoidance means among the nine majors. The engineering major family's aggression mean was near the midpoint. Sex was salient due to the disproportionate number of men as engineering majors and women as elementary education majors.

The second significant function separated the business major family from the architecture/design major family and the humanities major family. Aggression and absorption were most highly correlated with the function. The business major family had one of the higher aggression means while the architecture/design majors and the humanities major family had two of the lowest aggression means. In addition, the architecture/design major family had the highest absorption mean while the business major

family had a lower absorption mean (over one half of a standard deviation).

Personality Combined with Self-Efficacy and Interests

Our second hypothesis was that personality, combined with confidence and interests would significantly differentiate between college majors. In particular, confidence and interests were expected to contribute to additional variance above and beyond personality in discriminating college majors. To investigate our second hypothesis, a discriminant analysis was conducted by controlling for sex and entering three set of variables as predictors (11 MPQ primary scales, the six GCTs of the SCI, and the six GOTs of the SII). As shown in Table 2, the three sets of predictors significantly differentiated participants' college majors with a hit rate of 53.5% and a jack knife hit rate of 33.7%. The jack knife hit rate was three times greater than the chance probability of randomly selecting a major from the nine majors (1/9; 11%).

We also tested the significant improvement of the hit rate after adding the six SCI confidence themes and the six SII interest themes to the 11 MPQ primary scales as the predictors. We followed the calculation procedure reported in Tabachnick and Fidell (2001). The results indicated that the six GCTs and six GOTs contributed to additional variance beyond sex and the 11 MPQ primary scales in discriminating nine college majors, F (192, 2573.39) = 2.51, $p < .05$.

Our results indicated that the discriminant analysis, using the combination of the three sets of predictors, generated five significant functions in classifying the nine majors. As shown in Table 4, the first function separated the engineering major family from the humanities major family; the highest correlation coefficients with this function were the investigative GCT and GOT. As seen in Table 1, engineering majors had the highest investigative GCT and GOT means while humanities majors had one of the lowest means on both. The second function separated the computer science/accounting major family and the business major family from the physical and biological sciences; the conventional and enterprising GOTs had the highest correlation coefficients with the second function. Table 1 means reflect this split between these majors; computer science/accounting majors and business majors had the highest conventional and enterprising GOTs while science majors had one of the lowest means. The third function discriminated the architecture/design major family from the elementary education major family; the realistic GCT (negative) and the social GOT (positive) had the highest correlations with this function. The architecture/design

majors had the second highest realistic GCT while elementary education majors had the lowest; conversely, the former had the lowest social GOT while the latter had the highest social GOT. The fourth function differentiated the computer science/accounting major family from the business major family; the conventional GOT (positive) and the enterprising GOT (negative) had the highest correlations with the fourth function. Table 1 shows that business majors have higher enterprising and lower conventional GOT means compared to computer science/accounting majors. Finally, the fifth function separated the elementary education major family from the social sciences major family; the highest correlations for this function included traditionalism (positive), social GCT (negative), and artistic GOT (negative). Elementary education majors' means were higher on traditionalism (socially conservative) but lower on social confidence than social science majors; their mean artistic GOTs were similar.

Discussion

This is the first study to explicitly examine the unique roles of 11 personality traits (measured by MPQ) in the selection of majors. Moreover, this is the first study to examine personality, self-efficacy, and interests simultaneously as discriminants of major choice. Our findings expand the literature and advance our knowledge of how personality is associated with people's major choices. In particular, our findings support the assumptions of SCCT, namely that personality traits help to differentiate among choice actions and that self-efficacy and interests are more proximal determinants of those choice actions than personality.

Personality Alone

Personality traits discriminated among educational major families significantly better than chance in this sample. We also provided evidence that some traits are more salient than others in discriminating educational major families. This information is important because of the dearth of research investigating the unique contribution of personality traits in the selection of educational majors.

Positive emotionality. **Social closeness** helped separate the elementary education major family from the engineering major family in the first function. Our finding was similar to the finding of Ackerman and Beier (2003), who showed that the social trait complex *z* score (which included social closeness and social potency as part of the trait complex) was higher for adults who had majored in business (people-oriented major) than for adults who had majored in the physical sciences (less people-oriented major). It is important

to note that Ackerman and Beier did not have a major family corresponding to elementary education majors or engineering majors. Other related studies also provide indirect support for our findings (Larson & Borgen, 2002; Staggs et al., 2003; 2007). In these studies, social closeness was positively related to teaching interests and negatively related to mechanical activities, so it makes sense that social closeness would help separate elementary education majors from engineering majors.

Social potency, the social dominance component of PEM, did not emerge as salient in the discriminant analysis. We anticipated that social potency would be helpful in differentiating business majors because of the assumption that they would be more socially forceful and socially dominant than other major families and because of Ackerman & Beier's (2003) findings and related studies showing social potency to be a significant predictor of sales interests (Larson & Borgen, 2002; Staggs et al., 2003). However, social potency did not differ across the major families although the ranking of the means were consistent with our speculation such that business majors' means were higher than those of other majors. Our findings are consistent with Larson and colleagues (2007) who found no support for extraversion measured with the NEO-FFI in separating pharmacy, counseling, finance (similar to accounting in the U.S.), and engineering. Finally, achievement was expected to assist in separating majors and our findings did not support this assertion. Achievement means did not differ greatly across majors suggesting that students with a tendency to work hard and persist select majors across Holland's (1997) hexagon. As expected, wellbeing did not differ across major families.

Negative emotionality. **Aggression** (inverse of agreeableness) correlated highly with the first significant function helping to separate elementary education majors from engineering majors. Our results relate to Larson and colleagues' (2007) finding; they showed that agreeableness (inverse of aggression) helped separate a social major, namely counseling majors, from non social majors. Indirect support for our findings comes from meta-analytic studies showing social interests to be negatively related to aggression (Staggs et al., 2007) and positively related to agreeableness (Barrick et al., 2003; Larson et al., 2002). In our study, aggression was also salient in separating business from architecture/design major families. These results are consistent with Staggs and colleagues (2007) who showed that sales interests positively correlated with aggression while art interests negatively correlated with aggression.

Stress reaction yielded null findings in this study contrary to Larson and colleagues who found neuroticism as a salient discriminator in differentiating among four Taiwanese major group. The other related studies have shown minimal linkages between stress reaction or neuroticism and any of Holland's(1997) hexagonal interests (Barrick et al., 2003; Larson et al., 2002; Staggs et al., 2007) or self-efficacy themes (Larson & Borgen, 2006; Nauta, 2004). As expected, alienation was not shown to vary across major families based on prior studies (Larson & Borgen, 2006; Staggs et al., 2007).

Constraint. As predicted, **harmavoidance** correlated highly with the first function. This trait helped separate elementary education majors from engineering majors. Harmavoidance had not been examined previously regarding college major. However, harmavoidance had been negatively linked to realistic interests and specifically mechanical interests (Larson & Borgen, 2002; Staggs et al., 2003) as well as realistic confidence (Larson & Borgen, 2006; Staggs et al., 2007). Finally, traditionalism was somewhat helpful in combination with social confidence in separating elementary majors from social science majors.

Absorption. **Absorption** correlated highly with the second function separating architecture/design majors from business majors. Ackerman and Beier's (2003) finding are supportive of these findings showing absorption to help differentiate adults who had majored in arts and humanities from those in the physical sciences. Two other studies provide support as well (Larson & Borgen, 2002; Staggs et al., 2003).

Personality Combined with Self-Efficacy and Interests

Career counselors have long emphasized vocational interests across John Holland's hexagon as the cornerstone of assisting vocational clients to make choices about their careers. More recently, self-efficacy across Holland's (1997) hexagon has been incorporated into those conversations. The SCCT and empirical findings (e.g., Betz & Rottinghaus, 2006; Gasser et al., 2007; Harmon et al., 1994; Larson et al., 2007; Rottinghaus et al., 2003) have corroborated the reliance on both of these constructs in the consideration of choice actions, such as the selection of an educational major family. Prior to this study, researchers had not examined the contribution of self-efficacy and interests after personality traits were added as determinants of college major. Our findings are consistent with the concepts of SCCT that self-efficacy and interest are more proximal determination than personality in the choice action and with Ackerman and Heggestad's (1997) assertion that interests drive people to seek out activities while personality may be more prominent

after the choice is made. These findings are also consistent with the assertion that personality traits have already influenced these college students' confidence and interests prior to selecting an educational major. Our results are important because they provide more evidence that self-efficacy and interests are unique and not redundant with personality traits.

Implications

In the absence of information about confidence or assessment of interests, counselors may gain valuable information concerning their vocational clients by assessing some personality traits. Our findings combined with other authors' work (Larson et al., 2007) suggest that as a group, students who major in predominantly teaching (or social service) may tend to be more sociable, more agreeable (or less aggressive), and turn to others for comfort (social closeness). Students, as a group, who major in the humanities or the arts may be more entranced with stimuli and responsive to evocative sights and sounds (absorption). Students, as a group who major in engineering may be more likely to choose danger/adventure over boredom (inverse of harmavoidance) and be less socially close than students majoring in elementary education. Counselors may want to be cautious concerning assumptions about social dominance being more prevalent in business majors, as a group, until further examination by other investigators. The second implication is that counselors can be assured that assessing self-efficacy and interests are essential in assisting vocational clients with their choices of educational major. Far from redundant, assessments of interests and confidence are reaffirmed in these findings as the assessments of choice.

Limitations

Care was taken to ensure that the students were decided on their majors. Prior studies had relied on students' year in school as a proxy for decidedness. Limitations of the study include the omission of some major families, most notably agricultural major families, and the cross sectional nature of the sample. Finally, a limitation of this study was its racial and ethnic homogeneity; this sample was predominantly Caucasian. Diverse students were sampled but were too few to be considered separately.

Future Suggestions

Future researchers exploring the role of personality in career choice may want to expand the major families examined (e.g., agriculture major families) or examine related choice actions such as occupational

choice. Moving beyond career choices, researchers may also want to explore the role of personality traits in related vocational outcomes (e.g., satisfaction with major [e.g., Logue, et al., 2007]), academic choice goals and choice actions (e.g., educational aspirations [Rottinghaus, Lindley, green, & Borgen, 2002], persistence to complete degree), and academic outcomes (academic performance within the major, withdrawal). Finally, researchers need to seek out diverse samples in extending the validity of these findings beyond a predominantly Caucasian college sample.

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Table 1

Means and Standard Deviations of Multidimensional Personality Questionnaire (MPQ), Skills Confidence Inventory (SCI), and Strong Interest Inventory (Strong) by Major Family

	ENG		SEP		SCIENCE		ARC		HUM		SOC		ELE		BUS		CAC		TOT	
	45		42		51		40		39		42		21		46		42		368	
MPQ	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Wellbeing	18.42	6.39	19.49	5.14	17.49	6.32	17.93	4.73	18.06	5.99	18.24	4.60	20.57	3.65	18.06	5.13	16.74	5.16	18.19	5.43
Social																				
Closeness	13.83_{a}	5.16	15.90	4.10	14.62_{a}	5.36	14.33_{a}	4.20	15.74	4.43	14.78_{a}	4.55	18.48_{b}	3.08	16.28	3.74	13.94_{a}	4.11	15.13*	4.55
Social Potency	13.02	4.99	13.21	5.34	11.61	5.56	12.15	5.70	14.05	4.68	14.17	5.43	12.33	4.36	14.24	4.11	12.65	4.81	13.06	5.09
Achievement	13.84	4.34	12.74	4.77	12.65	4.69	13.32	4.73	13.24	5.13	12.18	4.70	11.78	4.80	11.78	4.91	12.88	3.65	12.76	4.64
Stress Reaction	11.09	6.80	10.73	6.32	13.30	7.58	12.53	6.88	12.29	5.97	12.45	6.66	10.43	6.43	10.70	6.93	13.72	6.79	12.01	6.79
Alienation	4.33	4.43	5.33	4.74	5.67	5.02	4.75	4.07	4.52	3.66	5.12	4.35	3.52	2.94	4.91	4.73	6.68	4.75	5.08	4.46
Aggression	6.98	4.11	7.62_{a}	4.95	7.04	3.60	6.05	3.55	5.93	3.88	8.38_{a}	4.48	4.19_{b}	2.38	8.24_{a}	4.15	8.54_{a}	4.34	7.18*	4.19
Harmavoidance	14.09_{a}	5.70	15.53_{a}	6.19	15.88_{a}	4.53	15.98_{a}	5.16	15.94_{a}	5.87	15.52_{a}	4.67	20.62_{b}	4.13	16.69	5.20	16.71	5.11	16.06*	5.37
Control	14.56	3.82	13.93	5.07	13.94	4.69	13.50	5.00	13.54	4.70	13.42	4.75	14.38	4.71	12.90	4.79	13.71	3.92	13.73	4.59
Traditionalism	16.99	3.74	18.26	4.13	16.78	4.94	16.92	3.84	16.02	4.62	17.31	3.97	19.67	3.07	16.64	3.87	16.02	3.22	17.03	4.10
Absorption	18.46	6.58	16.88	6.80	17.31	7.13	21.11	5.93	20.06	6.70	18.98	7.79	19.57	6.02	17.76	6.69	17.39	5.97	18.49	6.76
SCI GCTs																				
Realistic	3.84_{a}	0.63	3.10_{bc}	0.71	3.42_{ac}	0.71	3.52_{ac}	0.55	2.97_{b}	0.77	3.30_{bc}	0.58	2.72_{b}	0.47	3.16_{bc}	0.72	3.29_{bc}	0.82	3.30*	0.73
Investigative	3.76_{a}	0.67	3.08_{b}	0.63	3.55_{ac}	0.68	3.05_{b}	0.80	2.84_{b}	0.65	3.14_{bc}	0.72	2.75_{b}	0.60	2.94_{b}	0.78	3.32	0.75	3.20*	0.76
Artistic	2.94_{a}	0.86	2.66_{a}	0.70	3.06_{a}	0.66	3.50_{bc}	0.63	3.65_{b}	0.73	3.13_{ac}	0.87	3.10	0.77	3.10_{ac}	0.78	2.83_{a}	0.68	3.11*	0.80
Social	3.32_{a}	0.69	3.41_{a}	0.64	3.49	0.67	3.30_{a}	0.67	3.57	0.58	3.88_{b}	0.63	3.76	0.58	3.42_{a}	0.78	3.37_{a}	0.74	3.49*	0.69
Enterprising	3.16	0.71	3.16	0.62	2.94_{a}	0.82	3.18	0.70	3.29	0.79	3.35	0.65	2.84_{a}	0.72	3.50_{b}	0.72	3.28	0.72	3.21*	0.74

Conventional	3.63_{acd}	0.65	3.16_{bcd}	0.59	3.16_{bf}	0.77	3.08_{bf}	0.81	2.77_{b}	0.78	3.20_{bcd}	0.64	2.68_{b}	0.61	3.49_{def}	0.77	3.80_{ae}	0.69	3.26*	0.78

	ENG		SEP		SCIENCE		ARC		HUM		SOC		ELE		BUS		CAC		TOT	
Strong GOTs	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Realistic	59.57_{a}	8.05	51.73_{bc}	8.41	53.66_{bc}	8.95	51.45_{bc}	8.61	48.00_{bc}	7.61	52.96_{bc}	8.93	46.74_{b}	9.93	52.24_{bc}	9.6	56.20_{ac}	8.61	52.96*	9.29
Investigative	59.59_{a}	8.03	50.70_{bc}	8.60	55.49_{ac}	8.97	45.89_{b}	9.10	44.76_{b}	8.05	49.67_{b}	9.38	46.47_{b}	10.55	46.82_{b}	9.86	51.50_{bc}	8.98	50.55*	10.07
Artistic	50.08_{ac}	8.59	44.71_{a}	8.73	51.41_{ac}	9.36	54.60_{bc}	7.58	58.44_{b}	8.40	52.17_{ac}	9.45	53.80_{bc}	10.33	50.22_{ac}	8.41	48.69_{ac}	8.41	51.34*	9.39
Social	51.76_{ac}	8.99	52.86	8.35	52.43_{a}	9.68	48.85_{ad}	9.32	54.58	9.09	57.24_{bc}	8.99	60.53_{bd}	8.91	52.59_{a}	11.30	52.99	10.29	53.33*	9.82
Enterprising	49.26_{ac}	9.51	49.68_{ac}	10.21	47.73_{a}	10.75	49.88_{ac}	8.00	49.25_{ac}	9.51	52.24_{ac}	8.43	47.29_{ac}	9.35	59.67_{b}	8.71	54.68_{bc}	10.13	51.31*	10.11
Conventional	55.37_{ac}	10.23	51.68_{acd}	9.4	47.48_{d}	11.42	48.72_{ad}	11.60	46.61_{d}	11.48	50.63_{acd}	9.03	48.30_{ad}	9.33	57.30_{bc}	10.08	63.78_{b}	8.84	52.46*	11.48

Note. $N = 368$. GCT = general confidence themes. GOT = general occupational themes. ENG = Engineering; SEP = Sport and Exercise Physiology; SCIENCE = Physical and Biological Science; ARC = Architecture/Design; HUM = Humanities; SOC = Social Science; BUS = Business; CAC = Computer Science/Accounting. The number of men and women (men, women) for each majors are: ENG (29, 16), SEP (20, 22), SCIENCE (21, 30), ARC (14, 26), HUM (15, 24), SOC (21, 21), ELE (0, 21), BUS (24, 22), and CAC (27, 15).

In the Total column, the * indicates that the mean differed significantly across major at the $p < .005$ level and that mean GCTs and GOTs differed significantly across major at the $p < .008$.

a-f subscripts indicate significant mean level differences among the corresponding majors at $p < .05$ level.

Table 2

Discriminant Function Results for Predictor Sets Examining College Students' Major

Sets of Predictors	Hit rate %	Jack knife %	Squared canonical correlations[1]	Wilks's Λ^2	Number of Significant Discriminants
Sex	13.6	5.7	.092	.91	1
Sex + 11 MPQ primary scales	28.0	18.5	.164	.63	2
Sex + 11 MPQ primary scales + 6 SCI GCTs	42.7	29.3	.355	.29	4
Sex + 11 MPQ primary scales + 6 SCI GCTs + 6 Strong GOTs	53.5	33.7	.416	.17	5

Note. N = 368. MPQ = Multidimensional Personality Questionnaire. SCI GCTs = Skills Confidence Inventory General Confidence Themes. Strong GOTs = 2005 Strong Interest Inventory General Occupational Themes.

[1]The squared canonical correlation is the proportion of variance of the unstandardized first discriminant function scores that is explained by the differences in groups. **p* < .01.

[2] Wilks's lambda provides a significant test for the discriminant function.

Table 3

Group Centroids and Discriminant Structure Matrix for Discriminant Analyses of the MPQ as Predictors of Major Choice

Group or variable	1	2
Group	**Group Centroids**	
Engineering	-0.56	-0.31
Sport and Exercise Physiology	-0.01	0.33
Physical and Biological Sciences	-0.15	-0.05
Architecture/Design	0.15	-0.56
Humanities	0.17	-0.40
Social Sciences	-0.05	0.17
Elementary Education	1.45	-0.04
Business	0.21	0.50
Computer Science/Accounting	-0.41	0.28
MPQ Primary Scales	**Structure Matrix**	
Sex	.65	-.27
Wellbeing	.24	.01
Social Potency	.02	.19
Achievement	-.18	-.29
Social Closeness	.54	.23
Stress Reaction	-.15	-.10
Alienation	-.22	.23
Aggression	-.41	.59
Control	-.04	-.11
Harmavoidance	.50	.17
Traditionalism	.31	.09
Absorption	.17	-.44

Note. $N = 368$. MPQ = Multidimensional Personality Questionnaire.

Table 4

Group Centroids and Discriminant Structure Matrix for Discriminant Analyses of the Personality, Self-Efficacy, and Interests as Predictors of Major Choice

Group or variable	1	2	3	4	5
Group			**Group Centroids**		
Engineering	1.29	-0.37	-0.42	0.36	0.01
Sport and Exercise Physiology	0.41	0.14	0.65	-0.17	0.50
Physical and Biological Sciences	0.84	-0.76	0.02	-0.39	-0.18
Architecture/Design	-0.70	-0.53	-1.03	0.00	0.44
Humanities	-1.49	-0.62	-0.09	0.34	-0.38
Social Sciences	-0.13	0.02	0.61	-0.21	-0.63
Elementary Education	-0.88	-0.41	1.40	0.34	0.67
Business	-0.47	1.10	-0.36	-0.65	0.05
Computer Science/Accounting	0.33	1.24	-0.09	0.70	-0.12
MPQ Primary Scales			**Structure Matrix**		
Sex	-.21	-.22	.20	-.09	.33
Wellbeing	-.03	-.06	.17	-.04	.25
Social Potency	-.09	.10	.04	-.07	-.19
Achievement	.05	-.09	-.12	.20	.01
Stress Reaction	.02	-.02	-.07	.11	-.23
Alienation	.07	.12	-.02	.03	-.13
Aggression	.13	.29	-.02	-.17	-.32
Harmavoidance	-.15	.07	.19	.04	.24
Traditionalism	.02	-.07	.26	-.08	.36
Absorption	-.16	-.13	-.11	.11	.01
Social Closeness	-.17	.02	.26	-.18	.27
Control	.07	-.07	.04	.13	.07
SCI					
Realistic GCT	.34	-.11	-.43	.07	-.13
Investigative GCT	.48	-.11	-.18	.15	-.23
Artistic GCT	-.36	-.26	-.31	.00	-.21
Social GCT	-.10	-.05	.32	-.09	-.35
Enterprising GCT	-.11	.25	-.14	-.13	-.23
Conventional GCT	.34	.43	-.27	.16	-.15
SII					
Realistic GOT	.40	.12	-.23	.20	-.19
Investigative GOT	.60	-.12	-.03	.16	-.17
Artistic GOT	-.34	-.29	-.17	.16	-.37
Social GOT	-.09	.01	.42	.07	-.21
Enterprising GOT	-.09	.50	-.15	-.28	-.15
Conventional GOT	.20	.64	-.15	.38	-.01

Note. $N = 368$. SCI = Skills Confidence Inventory. GCT = the General Confidence Theme of the SCI. SII= 2005 Strong Interest Inventory. GOT = General Occupational Themes.